

Sanyo Energy(Suzou) Co.,Ltd.

Approval

Sanyo Test Report

	<u>Garry or Foot Proport</u>
Name of Sample	Lithium Ion Battery 3UR18650-2-T0712
Consignor	SANYO Energy(Suzhou) CO.,LTD
Manufacturer	SANYO Energy(Suzhou) CO.,LTD
Test Method	United Nations "Recomenndations on the TRANSPORT OF DANGEROUS GOODS"
Criterion	United Nations "Recomenndations on the TRANSPORT OF DANGEROUS GOODS"
Appearance	Black rectangular parallelepiped
Test Date	2010/01/07 - 2010/01/22
Sample Number	24
Test Items	Altitude simulation, Thermal test, Vibration test, Shock test, External short circuit, Overcharged
Conclusion	The sample has passed the items of UN38.3.
Remark	Certification by Similar Model: 3UR18650-2-T0627 Ratio of (3UR18650-2-T0712)/(3UR18650-2-T0627) [+]=100%, [-]=100%, [Electrolyte]=100%
Consignor Address	No.86 Sunwu Road, Xukou, Wuzhong District, Suzhou City, Jiangsu Province 215164, China

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B: Checklist for Judging New Type Battery or not

Confirmation of presence of change in "The element which is given influence" (Change \Rightarrow O, No change \Rightarrow -)

When there is no change in all items, it is NOT considered to be a New Type Battery.

Model which UN regulation test has cor	npleted 3UR18650-2-T0627
Target model which is not a new	type 3UR18650-2-T0712

Test Item (Function)	The element which is given influence	Presence of change
T1:Altitude Simulation (Decompression load)	 Crimped part, Gasket (Cell) Gas Release Vent, Cell Case (Cell) Pack (Plastic) Case Holding Member(Insulator, Insulation Tape, Both Sides Tape) Coating materials 	_
T2:Thermal Shock (Repetition of high temp. and low temp.)	 Crimped part, Gasket (Cell) Gas Release Vent, Cell Case (Cell) Finished state of Wound Electrodes (Cell) Pack (Plastic) Case Holding Member(Insulator, Insulation Tape, Both Sides Tape) Coating materials 	-
T3:Vibration (Vibration load)	 Finished state of Wound Electrodes (Cell) Electric wiring member Electronic Parts on a circuit board Cell Holding Member (Adhesive, Both Sides Tape, Lib of Plastic Case) 	_
T4:Shock(Shock load)	 Wiring Member Electronic Parts on a circuit board Cell Holding Member(Adhesive, Both Sides Tape, Lib of Plastic Case) Finished state of Wound Electrodes (Cell) 	_
T5:External Short Circuit(Short current)	 Over-voltage Protection Current Control Device Safety Device of cell (Cell) Lead Tab 	_
T6(Cell):Impact(Crash load)	Separator (Cell) Insulation State in a cell (Cell)	_
T7(Pack): Overcharge(Charge load)	Overcharge Protection Thermal Device Safety Device of cell (Cell)	_
Judgment result	New Type or not	New (Not new)

Sanyo Energy(Suzou) Co.,Ltd.

approval Check Writing

Certificate of UN test for Lithium ion battery

Customer Model : AS11A3E

Sanyo Model : 3UR18650-2-T0712

Sanyo Product Code: F12431154



	Manual of Tests and Criteria (38.3 Lithium batteries)		Note	Number of test batteries					
No.	Test item	results	Noto						
T 1	Altitude simulation	Pass							
T 2	Thermal test	Pass		First cycle	First cycle	After 50 cycles	After 50 cycles		
T 3	Vibration	Pass		fully charged	fully Discharged	fully charged	fully discharged		
T 4	Shock	Pass		4 batteries	4 batteries	4 batteries	4 batteries		
T 5	External short circuit	Pass							
Т 6	Impact	Pass		First cycle 5 cells for 10 cells for 5 cells for	cylindrical cell, prismatic cell,	After 50 cycles, 5 cells for cylir 10 cells for pris 5 cells for coin	ndrical cell, smatic cell,		
T 7	Overcharge	Pass	For battery only	First cycle fully	charged 4 batteries	After 50 cycles,fully	charged 4 batteries		
Т 8	Forced discharge	-	For cell only	For cell only					

Lithium ion battery Specification

Item	Nominal value	Note
Watt-hour rating	66 Wh	
Nominal voltage	11.1 V	
Lithium equivalent content	5.4 g	

We declare the above: The test result mentioned above was checked according to UN test.

(Manual of Tests and Criteria ST/SG/AC.10/11/Rev.4, PartIII, sub-section 38.3)

Certificate of Package Drop Test for Lithium ion battery

Customer Model : AS11A3E

Sanyo Model : 3UR18650-2-T0712

Sanyo Product Code: F12431154



Test item	Test results	Note
Package Drop Test	Pass	The package shall be dropped from 1.2meter high onto a concrete surface (flat and horizontal) with five orientations (drop once a sample); (1)flat on the bottom,(2)flat on the top,(3)flat on the long side, (4)flat on the short side, (5)on a corner

Lithium ion battery Specification

Item	Nominal value	Note
Watt-hour rating	66 Wh	
Nominal voltage	11.1 V	
Lithium equivalent content	5.4 g	

We declare the above: The test result mentioned above was checked according to UN test. (Model Regulations ST/SG/AC.10/1/Rev.15, Special Provision188)

1.Test Item: Altitude simulation (T1)

2.Test Purpose: This test simulates air transport under low-pressure conditions.

3.Test Procedure:

Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature(20±5°C).

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/7

6.Test Data

Battery No.		Mass(g)		Mass loss	Volta	ge(V)	Voltage	Other	D 14	T 1
		Before test	After test	(%) (=<0.1%)	Before test	After test	Retention(%)(=>90%)	event	Result	Judgement
At first	1	327.73	327.78	0.015	12.95	12.94	99.9	0	PASS	
cycle,in fully	2	328.58	328.69	0.033	12.97	12.96	99.9	0	PASS	
charged	3	328.44	328.46	0.006	12.97	12.97	100.0	0	PASS	
states	4	328.30	328.42	0.037	12.95	12.95	100.0	0	PASS	
At first	5	327.63	327.42	0.064				0	PASS	
cycle,in fully	6	328.29	327.99	0.091					PASS	
discharged	7	328.08	328.10	0.006				0	PASS	PASS
states	8	328.15	328.26	0.034				0	PASS	
After 50	9	328.60	328.56	0.012	12.97	12.97	100.0	0	PASS	TASS
cycles ending in	10	328.67	328.67	0.000	12.96	12.96	100.0	0	PASS	
fully charged	11	327.57	327.32	0.076	12.97	12.97	100.0	0	PASS	
states	12	327.89	328.02	0.040	12.97	12.97	100.0	0	PASS	
After 50	13	327.33	327.37	0.012				0	PASS	
cycles ending in	14	327.78	328.02	0.073				0	PASS	
fully discharged	15	328.51	328.65	0.043				0	PASS	
states	16	328.31	328.36	0.015				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, 0-No leakage, no venting, no disassembly, no rupture & no fire

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1.Test Item: Thermal Test (T2)

2.Test Purpose: This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

3.Test Procedure:

Test cells and batteries are to be stored for at least six hours at a test temperature equal to $75\pm2^{\circ}$ C, followed by storage for at least six hours at a test temperature equal to $-40\pm2^{\circ}$ C. The maximum time internal between test temperature extremes is 30 minutes. This procedure is to be repeated 10 times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ($20\pm5^{\circ}$ C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/8-2010/1/14

6.Test Data

		Mass(g)		Mass loss	Volta	ge(V)	Voltage	Other		
Battery N	Battery No.		After test	(%) (=<0.1%)	Before test	After test	Retention(%)(=>90%)	event	Result	Judgement
At first	1	327.78	327.57	0.064	12.94	12.73	98.4	0	PASS	
cycle,in fully	2	328.69	328.50	0.058	12.96	12.70	98.0	0	PASS	
charged	3	328.46	328.28	0.055	12.97	12.75	98.3	0	PASS	
states	4	328.42	328.24	0.055	12.95	12.74	98.4	0	PASS	
At first	5	327.42	327.22	0.061				0	PASS	
cycle,in	6	327.99	328.10	0.034				0	PASS	
fully discharged	7	328.10	327.92	0.055				0	PASS	
states	8	328.26	328.08	0.055				0	PASS	PASS
After 50	9	328.56	328.41	0.046	12.97	12.77	98.5	0	PASS	PASS
cycles ending in	10	328.67	328.49	0.055	12.96	12.79	98.7	0	PASS	
fully charged	11	327.32	327.35	0.009	12.97	12.79	98.6	0	PASS	
states	12	328.02	327.89	0.040	12.97	12.80	98.7	0	PASS	
After 50	13	327.37	327.17	0.061				0	PASS	
cycles ending in	14	328.02	327.83	0.058				0	PASS	
fully discharged	15	328.65	328.67	0.006				0	PASS	
states	16	328.36	328.18	0.055				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, 0-No leakage, no venting, no disassembly, no rupture & no fire

1.Test Item: Vibration (T3)

2.Test Purpose: This test simulates vibration during transport.

3.Test Procedure:

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm(1.6 mm total excursion) and thefrequency increased until a peak acceleration of 8gn occurs (approximately 50Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200Hz.

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/15-2010/1/18

6.Test Data

D // N	т.	Mas	ss(g)	Mass loss	Volta	ge(V)	Voltage	Other	D 1	T 1
Battery No.		Before test	After test	(%) (=<0.1%)	Before test	After test	Retention(%)(=>90%)	event	Result	Judgement
At first	1	327.57	327.66	0.027	12.73	12.72	99.9	0	PASS	
cycle,in fully	2	328.50	328.63	0.040	12.70	12.68	99.8	0	PASS	
charged	3	328.28	328.50	0.067	12.75	12.74	99.9	0	PASS	
states	4	328.24	328.46	0.067	12.74	12.73	99.9	0	PASS	
At first	5	327.22	327.47	0.076				0	PASS	
cycle,in fully	6	328.10	328.37	0.082				0	PASS	
discharged	7	327.92	328.06	0.043				0	PASS	
states	8	328.08	328.13	0.015				0	PASS	PASS
After 50	9	328.41	328.44	0.009	12.77	12.77	100.0	0	PASS	FASS
cycles ending in	10	328.49	328.59	0.030	12.79	12.79	100.0	0	PASS	
fully charged	11	327.35	327.40	0.015	12.79	12.78	99.9	0	PASS	
states	12	327.89	327.96	0.021	12.80	12.79	99.9	0	PASS	
After 50	13	327.17	327.40	0.070				0	PASS	
cycles ending in	14	327.83	327.99	0.049				0	PASS	
fully discharged	15	328.67	328.66	0.003				0	PASS	
states	16	328.18	328.19	0.003				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, 0-No leakage, no venting, no disassembly, no rupture & no fire

1.Test Item: Shock (T4)

2.Test Purpose: This test simulates possible impacts during transport.

3.Test Procedure:

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of pack acceleration of $150 \, g_n$ and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of $18 \, \text{shocks}$.

However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of $50~g_n$ and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/19

6.Test Data

D // N	Dattany N-		ss(g)	Mass loss	Volta	ge(V)	Voltage	Other	D 1/	
Battery No.		Before test	After test	(%) (=<0.1%)	Before test	After test	Retention(%)(=>90%)	event	Result	Judgement
At first	1	327.66	327.69	0.009	12.72	12.72	100.0	0	PASS	
cycle,in fully	2	328.63	328.60	0.009	12.68	12.67	99.9	0	PASS	
charged	3	328.50	328.46	0.012	12.74	12.74	100.0	0	PASS	
states	4	328.46	328.27	0.058	12.73	12.72	99.9	0	PASS	
At first	5	327.47	327.60	0.040				0	PASS	
cycle,in fully	6	328.37	328.32	0.015				0	PASS	
discharged	7	328.06	328.03	0.009				0	PASS	
states	8	328.13	328.10	0.009				0	PASS	PASS
After 50	9	328.44	328.45	0.003	12.77	12.77	100.0	0	PASS	FASS
cycles ending in	10	328.59	328.57	0.006	12.79	12.78	99.9	0	PASS	
fully charged	11	327.40	327.32	0.024	12.78	12.78	100.0	0	PASS	
states	12	327.96	327.75	0.064	12.79	12.79	100.0	0	PASS	
After 50	13	327.40	327.33	0.021				0	PASS	
cycles ending in	14	327.99	327.86	0.040				0	PASS	
fully discharged	15	328.66	328.70	0.012				0	PASS	
states	16	328.19	328.23	0.012				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, 0-No leakage, no venting, no disassembly, no rupture & no fire

UN Test Data (Model 1.Test Item: External short circuit (T5)

2.Test Purpose: This test simulates an external short circuit.

3.Test Procedure:

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches $55\pm2^{\circ}$ C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.10hm at $55\pm2^{\circ}$ C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to $55\pm2^{\circ}$ C. The cell or battery must be observed for a further six hours for the test to be concluded.

SANYO Internal Procedure:

As above.

4.Test Requirements:

External temperature of test batteries does not exceed 170°C and there is no disassembly,no rupture and no fire within six hours of this test.

5.Test Date: 2010/1/21-2010/1/22

6.Test Data

Bat	tery No.	Maximum temperature (°C)	Other event	Result	Judgement
At first cycle,in fully charged states	1	54.9	0	PASS	_
	2	54.7	0	PASS	
	3	54.9	0	PASS	
	4	54.8	0	PASS	
At first	5	54.9	0	PASS	
cycle,in fully discharged states	6	54.7	0	PASS	
	7	54.9	0	PASS	DACC
	8	54.7	0	PASS	
After 50	9	54.8	0	PASS	PASS
cycles ending in fully charged states After 50 cycles ending in fully discharged	10	54.6	0	PASS	
	11	54.6	0	PASS	
	12	54.3	0	PASS	PASS
	13	54.7	0	PASS	
	14	54.3	0	PASS	
	15	54.6	0	PASS	
states	16	54.3	0	PASS	

Notes: D-Disassembly, R-Rupture, F-Fire, 0-No disassembly, no rupture & no fire

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1.Test Item:Impact (T6)

2.Test Purpose: This test simulates an impact.

3.Test Procedure:

The test sample cell or component cell is to be placed on a flat surface. A 15.8mm diameter bar is to be placed across the center of the sample. A 9.1kg mass is to be dropped from a height of 61±2.5cm onto the sample.

A cylindrical or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8mm diameter curved surface lying across the centre of the test sample. A prismatic cell is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each impact. A coin or button cell is to be impacted with the flat surface of the sample parallel to the flat surface and the 15.8mm diameter curved surface lying across its center.

SANYO Internal Procedure:

As above.

4.Test Requirements:

External temperature of test batteries does not exceed 170°C and there is no disassembly and no fire within six hours of this test.

5.Test Date: 2009/10/21

6.Test Data:

Cell No.		Maximum Temperature(°C)	Other event	Result	Judgement
At first cycle, 50% charged	1	120	0	PASS	
	2	126	0	PASS	
	3	122	0	PASS	
	4	135	0	PASS	
	5	139	0	PASS	
	6		0		
states	7		0		
	8		0		PASS
	9		0		
	10		0		
	11	43	0	PASS	
	12	40	0	PASS	
After 50	13	45	0	PASS	
cycles ending, in fully discharged states	14	42	0	PASS	
	15	41	0	PASS	
	16				
	17				
	18				
	19				
	20				

Notes: D-Disassembly, F-Fire, 0-No disassembly & no fire

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1.Test Item:Overcharge (T7)

2.Test Purpose: This test evaluates the ability of a rechargeable battery to withstand an overcharge condition.

3.Test Procedure:

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

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(b) when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

SANYO Internal Procedure:

Min.Charge Voltage:	22V
Charge Current:	3.6A

4.Test Requirements:

There is no disassembly and no fire within seven days of the test.

5.Test Date: 2010/1/12-2010/1/20

6.Test Data

Battery No.		Event	Result	Judgement
At first	1	0	PASS	
cycle in fully	2	0	PASS	
charged states	3	0	PASS	
states	4	0	PASS	PASS
After 50	5	0	PASS	rass
cycles ending in	6	0	PASS	
fully	7	0	PASS	
charged states	8	0	PASS	

Notes: D-Disassembly, F-Fire, 0-No disassembly & no fire

1.Test Item: Drop Test P.10/10

2.Test Purpose: This test simulates the drop of the packaging during transport.

3.Test Procedure:

Number of Test Samples (Per design type, Manufacturer) and Drop Orientation For other than flat drops the centre of gravity must be vertically over the point of impact. Where more than one orientation is possible for a given drops, the orientation most likely to result in failure of the packaging must be used.

Packaging	Number of test samples	Drop orientation
Boxes of natural wood	Five (one for each drop)	First drop: flat on the bottom
Plywood boxes		Second drop: flat on the top
Reconstituted wood boxes		Third drop: flat on the long side
Fibreboard boxes		Fourth drop: flat on the short side
Plastic boxes		Fifth drop: on a corner
Steel or aluminum boxes		
Composite Packagings		
which are in the shape of a box.		

SANYO Internal Procedure:

Packaging: Fiberboard boxes. Number of test samples: Five(one for each drop). It may do the drop of five orientations with one sample if the packing does not have the big damage.

Drop orientation: As above.

4.Test Requirements:

A Package passes the test if it meets the following criteria:

Each package is capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell cell) contact and without release of contents.

5.Test Date: 2010/12/8

6.Test Data: PASS(Drop height 1.2m)

- 6-1. No any package crack
- 6-2. No any cell damege and battery damage.
- 6-3. No any out side release of contents from shipping box
- 6-4. No any contact between battery and battery, cell and cell.

Packaging size:
284*176*350
mm
Packaging weight (before):
6.5
kg
Packaging weight (after):
6.5
kg